



Factory Service Bulletin

2600 WALDEN AVE. • BUFFALO, NEW YORK 14225 • UNITED STATES
51 NANTUCKET BLVD. • SCARBOROUGH, ONT. M1P 2N6 • CANADA
WAALHAVEN • Z.Z. 48 ROTTERDAM • THE NETHERLANDS

SUBJECT: **Prodigy modifications**

NUMBER: **1312**

DATE: **7-81**

997-045096-001

S/N below 8078 ----- Kit # 1 ----- 997-0450096-001
S/N 8078 and above ---- Kit # 2 ----- 997-0450096-002

This bulletin is an excerpt from the complete Prodigy service manual and describes all modifications, changes and updating from initial production through the current manufacturing process.

It is estimated that the installation time for the interface kits is as follows:

S/N below 8078	997-0450096-001	3 hours
S/N 8078 and above	997-0450096-002	2 hours

993-045097-001



SECTION 6

MODIFICATIONS

6.1 GENERAL INFORMATION

This section provides updating information on the first 11,000 Prodigys produced and also presents various ways to modify the synthesizer for interfacing. Instruments below serial number 4160 are very difficult to modify and require skillful and delicate use of a soldering iron as described below. Instruments above serial number 4160 are easier to modify and have a newer printed circuit board which accommodates the appropriate interfacing pads. In addition, the modifications described provide additional interfacing ideas for use with sequencers and other accessory devices not found in standard production Prodigys.

6.1.1 SOLDERING TECHNIQUES

CAUTION

A low wattage soldering iron of less than 40 watts, such as Radio Shack 64-206, **MUST** be used to avoid damage to printed circuit board "traces." The excessive heat of higher power irons or soldering "guns" destroys boards by lifting the fragile copper traces.

To solder a lead to a trace, scrape approximately 1/4 inch of insulation from the trace with a knife and tin the trace and component lead(s) **BEFORE** attaching them. After tinning, hold the component lead against the trace and heat both until the iron just "re-flows" the solder. Failure to do this may result in severe trace damage. Use only a high grade ROSIN CORE solder such as Radio Shack 64-002 but not any type of ACID CORE solder.

When it is necessary to cut a trace, use a sharp knife to remove approximately 1/16 inch of the trace, so that solder bridges do not result.

When unsoldering components, use a desoldering tool such as Radio Shack 62-2085.

If IC sockets are added or replaced, use a high quality nylon type such as those made by AMP. The use of Molex sockets is not recommended. The high impedance circuits of synthesizers require the best possible insulation resistance and very low contact resistance.

Resistors added to the component side of the board must be glued to the board with a silicon adhesive to eliminate any possible movement.

CAUTION

After necessary soldering is completed, **ALL FLUX MUST BE REMOVED** from the board with a flux remover such as Radio Shack 64-2324. If the flux deposits are not removed, pitch instability problems may result.

6.1.2 COMPONENT GUIDELINES

Components required for modification are as follows:

- a. All resistors are 5%, 1/4 watt unless otherwise noted.
- b. All resistors specified as 1% are RN55D type 1%, 1/4 or 1/8 watt, metal film resistors.
- c. All signal diodes are 1N4148s.
- d. All wire is 24 gauge, stranded.

For connector repair and replacement, refer to the following paragraphs and illustrations.

The connectors are the C.I.S. (Commercial Interconnection System) crimp socket type made by AMP which have 0.1 inch (2.5mm) mounting centers. This is a reliable connection system which can easily be replaced if necessary. The portion of the connector attached to the printed circuit board (header) is replaced by simply soldering a new one in place. Headers of 5, 6 or more pins can easily be cut using wire cutters to replace 1, 2, 3 or 4 pin versions. Simply

score the header where the desired cut is to be made and cut the header appropriately. Refer to the accompanying illustrations.

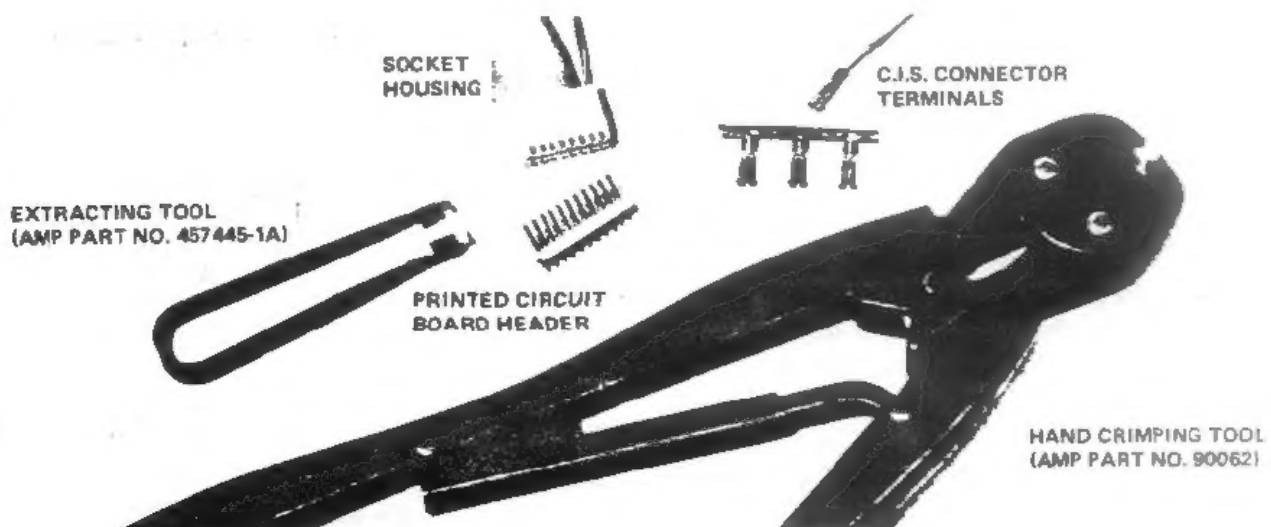
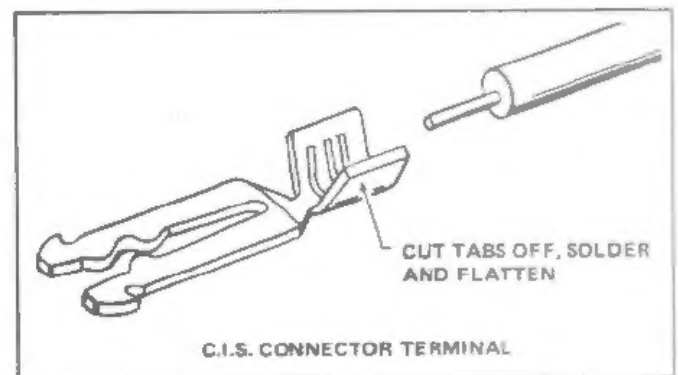
Headers which are causing poor or intermittent solder connections on a printed circuit board should be resoldered to ensure the best possible electrical and mechanical connection. If connector plating problems are suspected, use an extra activated multicore solder such as 0.064 diameter ERSIN No. 782/745 solder and heat the terminal thoroughly using a 40 watt soldering iron.

NOTE:

Be sure to avoid long exposure of the iron to the printed circuit board traces and to clean the activated flux residue from the printed circuit board after soldering is complete. Recommended flux cleaners are Miller-Stephenson MS-190HD, "Heavy Duty Flux Remover" or Radio Shack 64-2324, a methyl ethyl ketone product.

Replacement of the female C.I.S. connector terminal is sometimes necessitated if a wire breaks at the crimp within the socket. The spring loaded terminal may be removed using an AMP Extracting Tool, AMP P/N 457445-1A or by inserting two pointed instruments into each side of the socket allowing a particular terminal to be pulled out or pushed out using an existing header pin or 1/4 watt resistor lead. The new terminal may be attached to the wire by using an

AMP Hand Crimping Tool, AMP P/N 90062, or by cutting the tabs off the new terminal and tack soldering it to the appropriate wire which has been stripped back 5/32 inch (3.9mm). The soldering must be neat and flattened with needle-nose pliers to ensure an easy fit into the connector housing. When finished, push the terminal into the housing until it is back in place.



6.2 PRODUCTION MODIFICATIONS FOR SERIAL NUMBERS 1001 THROUGH 4160

The following modifications were performed at the factory during the first production run and are listed for your information and to update the original schematics.

SYMPTOM: Oscillator 1 octave tuning problems.
REMEDY: Change R1 and R2, matched 2 megohm $\pm 1\%$, to matched 1 megohm $\pm 1\%$.

SYMPTOM: Continuous trigger caused by keyboard oscillation due to capacitive loading of U12B.

REMEDY: Replace C23 .01uf with a 10K $\pm 5\%$ resistor.

SYMPTOM: VCA will not trim.

REMEDY: Change R130 from 1 megohm to 51K $\pm 5\%$.

SYMPTOM: Lack of dead band in SYN mode due to leakage of CR1 and CR2 (1N4148).

REMEDY:

1. Change C9 and C15 from 47pf to 100pf disc to increase the reset pulse from 1.0 usec to 1.5 usec.
2. Replace CR1 and CR2 with FDH-333 low leakage diodes or the base-emitter junction of two 2N3904 transistors.
3. Delete R91 (2.4 megohm) and R92 (10K trim).

SYMPTOM: Oscillator 1 rectangular waveform disappears at high frequency.

REMEDY: Interchange R41 and R57.
a) Change R41 from 2K to 18.2K.
b) Change R57 from 18.2K to 2K.

SYMPTOM: Operating the WAVEFORM SELECT switch (SW4 or SW5) detunes oscillator(s) more than 6 cents.

REMEDY: Requires four trace cuts and tack on the following and refer to "Soldering Techniques," paragraph 6.1.1.
a) Jumper wire from pin 2 to pin 6 of U7.
b) Jumper wire from pin 2 to pin 6 of U10.

c) Jumper wire from the emitter of Q15 to hot side of R48.

d) Jumper wire from the emitter of Q17 to hot side of R74.

e) 75K resistor from Q15 to -12V.

f) 75K resistor from Q17 to -12V.

SYMPTOM: Keyboard S & H Problems.

REMEDY: Cut trace between pin 7 of U14 and ground and tack on the following:

a) Diode (1N4148) between pin 5 of U14 and ground (anode to ground).

b) 1K $\pm 5\%$ resistor from pin 7 of U14 to ground.

c) 39K $\pm 5\%$ resistor from pin 7 of U14 to -12V (pin 4 of U12).

SYMPTOM: Unable to set TEMP TRIM R14 due to internal substrate variations of CA3406 ICs.

REMEDY: National 3046 (LM3046) or selected RCA 3046s (P/N 991-041104-002) should be used for U1 and U3.

6.3 PRODUCTION MODIFICATIONS FOR SERIAL NUMBER 2000 (APPROXIMATELY) AND ABOVE

These modifications were incorporated on serial numbers 2000 and above and should be made on serial numbers below 2000 when returned for service or as required.

SYMPTOM: Occasional (intermittent) pitch change when releasing a key caused by keyboard contact bounce.

REMEDY: Add a .01 disc capacitor (P/N 947-040200-103) from pin 3 of U14 to ground.

SYMPTOM: SYNC switch SW3 detunes oscillator and/or oscillator jitters.

REMEDY: Delete C12 and C20 (10pf or 500pf).

SYMPTOM: DC offset on SIGNAL OUT jack due to input bias current of U17A.

REMEDY: Change R125 from 1 megohm to 100K $\pm 5\%$, 1/4W (P/N 852-312104-001).

SYMPTOM: Oscillator scale drifts after 15 minute warm up or difficulty in adjusting TEMP trim(s).

REMEDY: Replace R15 and R36 (3.01K 1%) with 3.32K 1% (P/N 853-423321-031) and reset TEMP trims as specified in Alignment Procedures.

SYMPTOM: Unable to adjust oscillator(s) SCALE TRIM (R7 and R28). Oscillator SCALE TRIM(S) at end of rotation.

REMEDY: 1. Add a .10K trimpot to the board at the location marked R92. R92 was previously removed. See "lack of dead band operation" for serial numbers 1001 through 4160. This trimpot is to be designated R178 and is adjusted to scale the keyboard C.V. (Pin 1 of U12A) to 1.000 V/oct +/-10mV.
2. Tack on a 301K +/- 1% (P/N 853-423013-031) from the wiper of R92 to pin 6 of U11B.

SYMPTOM: Excessive keyboard C.V. drift (greater than 4 mV/sec) at pin 1 of U12.

REMEDY: 1. Ensure board is clean (free of flux and contamination) around A12 (between pins 3 and 4 in particular).
2. If problem still exists after board is clean, the problem is due to the input bias current of A12. Replace A12 with a selected IC (P/N 991-042908-002). Use of an IC socket is highly recommended. NOTE: Clean board thoroughly after soldering.

SYMPTOM: Difficulty in adjusting FILTER SCALE trimpot R122 due to tolerance build up.

REMEDY: Change R122 from 250 ohms to 470 ohms. NOTE: Filter tracking error is specified at 8% and will drift with temperature. This is normal and not a problem.

SYMPTOM: Oscillator tuning problems. Scaling of Oscillator(s) changes with footage of oscillator(s) and scaling error increases in lower footages. This is caused by leakage in tuning capacitors C14 and C8.

REMEDY: 1. Change C14, .001uf polycarbonate (green) or polypropylene (blue cylinder), to a .001uf polyester (white box style) (P/N 946-040229-102).
2. Change C8, .001uf or .0022uf polycarbonate (green) or polypropylene (blue cylinder), to a .0022uf polyester (white box style) (P/N 946-040229-222).

6.4 INTERFACE MODIFICATIONS FOR SERIAL NUMBER 4160 AND BELOW

6.4.1 GENERAL PREPARATION

- Unsolder and remove U12, U19, U20 and U21.
- Insert and solder IC sockets for the above ICs.
- Reinsert the above ICs in their respective sockets.
- Remove flux from board. See Soldering Techniques, paragraph 6.1.1.

6.4.2 VCF INPUT (1 VOLT/OCTAVE)

- Solder one end of a 60.4K +/- 1% resistor to the top end of R117 on the component side of the board.
- Solder a 16 inch yellow wire to the free end of the 60.4K resistor.
- Route the wire along the board and through the unused mounting hole located between the SYNC switch SW3 and the INTERVAL control R21.

6.4.3 OSCILLATOR INPUT (1 VOLT/OCTAVE)

- Solder one end of a 100K +/- 1% resistor to the bottom end of R89 on the component side of the board.
- Solder a 14 inch white/violet wire to the free end of the 100K resistor and follow the procedure in paragraph 6.4.2, step c.

6.4.4 S-TRIGGER IN/OUT

- Cut the trace at pin 13 of U21.
- Solder a 10K +/- 5% resistor diagonally between the two jumpers located between U21 and the FILTER ATTACK control R150 on the component side of the board.

c. Solder a 100 ohm \pm 5% resistor to the top of the jumper located immediately to the right of U21 pin 13 on the component side of the board.

d. Solder a 14 inch white/green wire to the free end of the 100 ohm resistor (S-TRIGGER).

e. Solder a 14 inch green wire to the mounting pin of the green transformer wire (S-TRIGGER ground).

f. Twist the wires together and run them through the unused mounting hole located between the CONTOUR AMOUNT control R120 and the EMPHASIS control R140.

6.4.5 GATE (V-TRIGGER) IN/OUT

a. Solder a 100K \pm 5% resistor between the bottom end of R78 and the jumper to the left of R78 on the component side of the board.

b. Remove the jumper located immediately to the left of the EMPHASIS control R140.

c. Solder the anode of a 1N4148 diode in the hole of the removed jumper nearest the edge of the board.

d. Solder a 14 inch white/orange wire to the cathode of the diode (GATE OUT).

e. Solder one end of a 10K \pm 5% resistor to the other hole of the removed jumper.

f. Solder a 14 inch orange wire to the free end of the 10K resistor and follow paragraph 6.4.4, step f (GATE IN).

6.4.6 KEYBOARD CONTROL VOLTAGE (IN/OUT)

a. Cut the trace between pins 1 and 2 of U12.

b. Cut the traces at pins 1 and 2 of U12.

c. Solder a 4.7K \pm 5% resistor between pins 1 and 2 of U12 on the trace side of the board.

d. Solder a jumper wire from the trace that formerly went to pin 1 of U12 to pin 2 of U12.

e. Cut the trace going from R95 to U12 about 1 inch from R95.

f. Solder an insulated jumper from the R95 side of the trace to the trace which formerly went to pin 2 of U12.

g. Solder a 16 inch blue wire to the R95 side of the above trace (KEYBOARD IN).

h. Solder a 16 inch white/blue wire to the 4.7K resistor at pin 2 of U12 (KEYBOARD OUT).

i. Run the wires around the edge of the board to the component side and follow paragraph 6.4.2, step c.

6.4.7 SYNC INPUT

a. Looking at the trace side of the board with the transformer wires in the upper left hand corner, locate the SYNC switch SW3.

b. Cut the trace which goes to the lower center pin of the SYNC switch.

c. Solder an 8 inch white/red wire to the trace and refer to this wire as wire "A."

d. Solder an 8 inch white/yellow wire to the lower center pin of the switch and refer to this wire as wire "B."

e. Cut the trace which goes to the lower right pin of the SYNC switch and solder an 8 inch brown wire to this trace, referring to this wire as wire "C."

f. Solder an 8 inch white wire to the lower right pin of the SYNC switch and refer to this wire as wire "D."

g. Wire the SYNC jack according to the INTERFACE WIRING DIAGRAM, paragraph 6.7.

6.4.8 EXTERNAL AUDIO INPUT

The purpose of this jack is to process audio signals of musical instruments such as guitars, organs, etc., through the Prodigy audio chain (VCF and VCA). It is important to remember that using this jack will only provide an audio signal, NOT control voltage or trigger signals. Thus, a trigger has to be supplied either internally (from the keyboard) or externally (to the S-TRIG or GATE INPUTS) to allow the EXTERNAL AUDIO signal to be processed through the VCF and VCA and, thereby, to be heard.

Most synthesizer and amplifier pre-amplifier outputs are capable of producing a 0dBm signal. Therefore, this modification is based on a 0dBm (.775 volts R.M.S., 2.2 volts peak-to-peak) maximum input signal to obtain Full Drive Level. Under these conditions, the dropping resistor ("R") is a 43K ohm \pm 5% resistor. The input impedance is equal to the value of the dropping resistor ($Z_{IN} = "R"$).

For a sensitivity other than 0dBm, use one of the following simplified voltage divider formulas to determine the value of the dropping resistor needed.

NOTE

Use the E.I.A. standard resistor value that is closest to the calculated value.

If the calculated value is below 10K, loading of the input signal may result. Therefore, the use of a pre-amplifier is suggested.

6.4.8.1 VOLTAGE DIVIDER FORMULAS

For an input in R.M.S. volts:

$$\text{"R" } K\Omega = (E_{IN} \times 56.9) - 1$$

i.e. for $E_{IN} = .775$ volts R.M.S.

$$\text{"R" } K\Omega = (.775 \times 56.9) - 1 = 43.1K$$

For an input in peak-to-peak volts:

$$\text{"R" } K\Omega = (E_{in} \times 20) - 1$$

i.e. for $E_{in} = 2.2$ volts peak-to-peak

$$\text{"R" } K\Omega = (2.2 \times 20) - 1 = 43K$$

For an input in dBm:

$$\text{"R" } K\Omega = \frac{-1}{\log_{10} \frac{E_{IN} + 32.9}{20}} - 1$$

i.e. for an input of 0dBm:

$$\text{"R" } K\Omega = \frac{-1}{\log_{10} \frac{0 + 32.9}{20}} - 1 = 43.1K$$

6.4.8.2 EXTERNAL AUDIO INPUT INSTALLATION

a. Solder one end of a 43K +/- 5% resistor (see paragraphs 6.4.8 and 6.4.8.1) to the negative side of C25.

b. Solder a 14 inch grey wire to the free end of the 43K resistor.

c. Follow paragraph 6.4.2, step c (serial numbers below 4160).

6.4.8.3 BACK PANEL WIRING

a. Wire all jacks according to "Interface Wiring Diagram," paragraph 6.7.

6.5 INTERFACE MODIFICATIONS FOR SERIAL NUMBERS 4160 THROUGH 8077

6.5.1 GENERAL PREPARATION

a. Unsolder and remove U12.

b. Insert and solder an 8 pin D.I.P. socket in place for U12.

c. Reinsert U12 in the socket and remove all flux from the board.

6.5.2 VCF INPUT (1 VOLT/OCTAVE)

a. Solder a 28 inch yellow wire to the pad marked "VCF IN" located between the FILTER KYBD TRACKING switch SW6 and the EMPHASIS control R136.

b. Route the wire along the board to the left hand side (TUNE control R95).

6.5.3 OSCILLATOR INPUT (1 VOLT/OCTAVE)

a. Solder an 18 inch white/violet wire to the pad marked "OSC IN" located above the MOD SHAPE switch SW9.

b. Follow paragraph 6.5.2, step b (serial numbers 4160 through 8077).

6.5.4 S-TRIGGER IN/OUT

a. Solder a 28 inch white/green wire to the pad marked "S-TRIG IN/OUT" located to the right of the CUTOFF FREQUENCY control R141.

b. Solder a 28 inch green wire to the pad marked "TRIG GND" located to the right of the CUTOFF FREQUENCY control R141.

c. Follow paragraph 6.5.2, step b (serial numbers 4160 through 8077).

6.5.5 GATE (V-TRIGGER) IN/OUT

a. Locate R153 (to the left of EMPHASIS control R136).

b. Locate the trace which runs along the bottom of the board and goes to the bottom of R153.

c. Cut this trace approximately 3 inches away from R153.

d. Solder a 1N4148 diode across the cut with the cathode band pointing toward R153.

e. Cut this trace again, approximately 1-1/2 inches away from R153.

f. Solder a 14 inch white/orange wire to the cathode side of the trace (GATE OUT).

g. Solder a 14 inch orange wire to the R153 side of the trace (GATE IN).

h. Twist the wires together.

6.5.6 KEYBOARD CONTROL VOLTAGE IN/OUT

a. Cut the INSIDE trace of U12 at pin 2, NOT the OUTSIDE trace leading to R86. Unsolder the side of R90 leading to the KYBD IN/OUT pad and top solder it to the side of R86 leading to pin 2 of U12.

b. Solder a 16 inch blue wire to the pad marked "KYBD IN/OUT" located above U12 (KYBD IN).

c. Solder a 16 inch white/blue wire to the bottom side (leading to pin 2 of U12) of R86 (KYBD IN/OUT).

d. Follow paragraph 6.5.2, step b (serial numbers 4160 through 8077).

6.5.7 SYNC INPUT

a. Remove jumper J1, located below SYNC switch, connecting point "A" to "B."

b. Remove jumper J2 connecting point "C" to "D."

c. Solder a 14 inch white/red wire to the pad marked "A" and refer to this wire as "A."

d. Solder a 14 inch white/yellow wire to the pad marked "B" and refer to this wire as "B."

e. Solder a 14 inch brown wire to the pad marked "C" and refer to this wire as "C."

f. Solder a 14 inch white wire to the pad marked "D" and refer to this wire as "D."

g. Follow paragraph 6.5.2, step b (serial numbers 4160 through 8077).

6.5.8 EXTERNAL AUDIO INPUT

a. See paragraphs 6.4.8 and 6.4.8.1 (serial numbers below 4160).

b. Solder one end of a 43K resistor to the negative side of C26.

c. Solder a 24 inch grey wire to the free end of the 43K resistor.

d. Follow paragraph 6.5.2, step b (serial numbers 4160 through 8077).

6.5.9 BACK PANEL WIRING

a. Wire all jacks according to "Interface Wiring Diagram," paragraph 6.7.

6.6 INTERFACE MODIFICATIONS FOR SERIAL NUMBERS 8078 AND ABOVE

6.6.1 GENERAL PREPARATION

Follow paragraph 6.5.1, steps a, b and c (serial numbers 4160 through 8077).

6.6.2 GATE (V-TRIGGER) IN AND OUT

Follow paragraph 6.5.5, steps a through h (serial numbers 4160 through 8077).

6.6.3 KEYBOARD CONTROL VOLTAGE (IN/OUT)

a. See paragraph 6.5.6, step a (serial numbers 4160 through 8077).

b. Unsolder the white/blue wire from the "KYBD IN/OUT" pad and solder this wire to the bottom side (leading to pin 2 of U12) of R86 (KYBD IN/OUT).

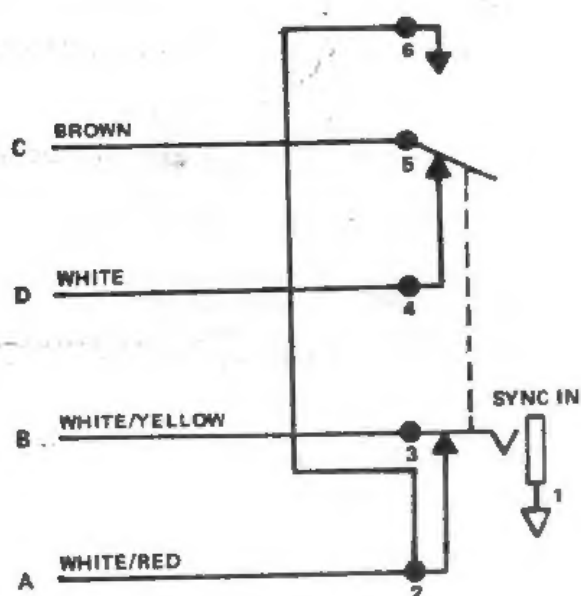
c. Solder a 16 inch blue wire to the pad marked "KYBD IN/OUT" (KEYBOARD IN).

d. Follow paragraph 6.5.2, step b (serial numbers 4160 through 8077).

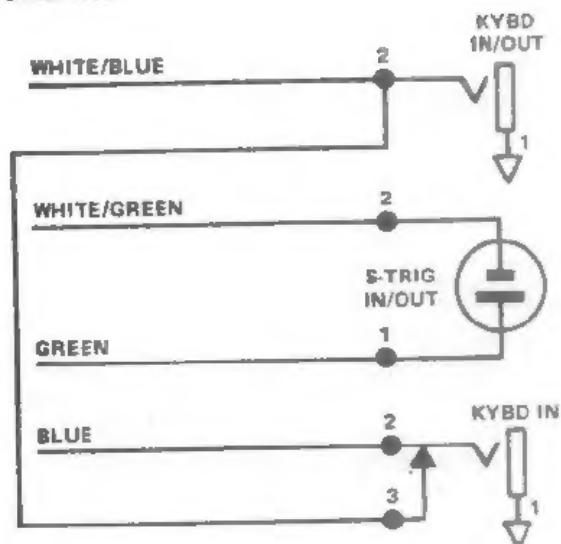
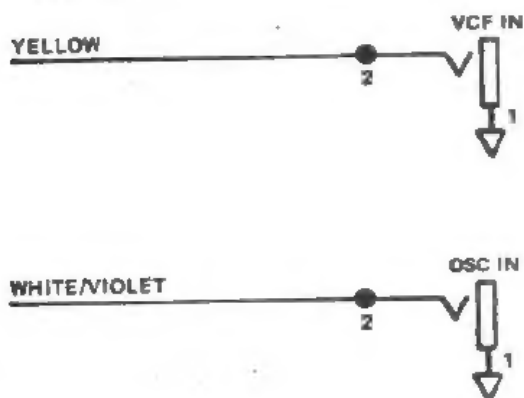
6.6.4 EXTERNAL AUDIO INPUT

Follow paragraph 6.5.8, steps a through d (serial numbers 4160 through 8077).

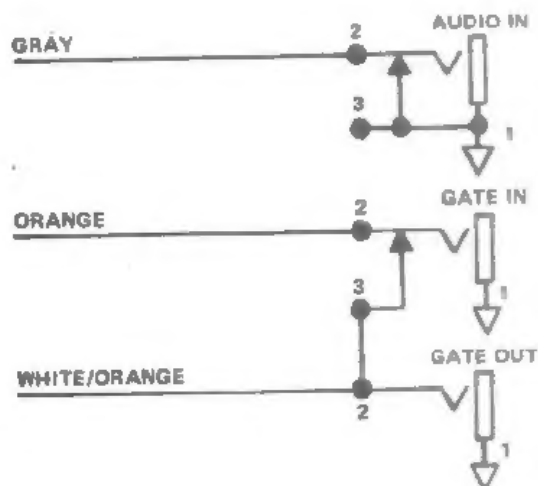
6.7 INTERFACE WIRING DIAGRAMS FOR ALL SERIAL NUMBERS



Connect Terminal 6 and Terminal 2 (two wires) of the SYNC IN jack together using a short piece of white/red wire.



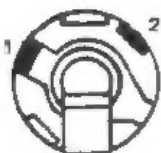
Connect Terminal 3 of the KYBD IN jack to Terminal 2 of the KYBD IN/OUT jack using the 8 inch length of white/blue wire cut to size.



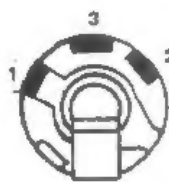
Connect Terminal 3 of the GATE IN jack to Terminal 2 (two wires) of the GATE OUT jack using a short length of orange wire. Connect all ground lugs (pin 1) together using bare buss wire to pin 1 of HIGH LEVEL AUDIO OUT.



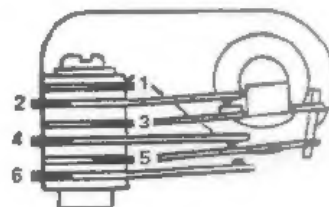
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910-041452-002



910-041452-001



910-045180-001

6.7.1 INTERFACE KITS PARTS LIST

The following parts lists describe the parts available in the Prodigy Interface Kits. These parts may be ordered in kit form or individually.

PARTS LIST

PART NO. 997-045096-001
(SERIAL NO.'s BELOW 8078)

QTY	PART NUMBER	DESCRIPTION
1	852-312101-001	Resistor, Carbon Film, 100 Ω , \pm 5%
1	852-312472-001	Resistor, Carbon Film, 4.7K Ω , \pm 5%
2	852-312103-001	Resistor, Carbon Film, 10K Ω , \pm 5%
1	852-312433-001	Resistor, Carbon Film, 43K Ω , \pm 5%
1	852-312104-001	Resistor, Carbon Film, 100K Ω , \pm 5%
1	853-426042-031	Resistor, Metal Film, 60.4K Ω , \pm 1%
1	853-421003-031	Resistor, Metal Film, 100K Ω , \pm 1%
1	906-042012-008	Socket, IC, 8 Pin
3	906-045188-014	Socket, IC, 14 Pin
3	910-041452-001	Jack, Phone 1/4", NC
4	910-041452-002	Jack, Phone 1/4", NO
1	910-041696-002	Connector, 2 Pin, Cinch
1	910-045180-001	Jack, Phone 1/4" W/Isolated SPDT Switch
1	913-045098-001	Overlay, Rear Panel
2	919-041075-001	Diode, 1N4148
1	993-045097-001	Bulletin No. 1312

WIRES: LENGTH (IN INCHES) AND COLOR

2	987-040751-111	8 and 14, Brown
2	987-040751-333	14 and 14, Orange
2	987-040751-444	16 and 28, Yellow
2	987-040751-555	14 and 28, Green
3	987-040751-666	16, 16 and 16, Blue
2	987-040751-888	14 and 24, Gray
2	987-040751-999	8 and 14, White
2	987-040751-929	8 and 14, White/Red
2	987-040751-939	14 and 14, White/Orange
3	987-040751-949	14, 14 and 8, White/Yellow
2	987-040751-959	14 and 28, White/Green
3	987-040751-969	16, 8 and 16, White/Blue
1	987-040751-979	18, White/Violet

PARTS LIST

PART NO. 997-045096-002
(SERIAL NO. 8078 AND ABOVE)

QTY	PART NUMBER	DESCRIPTION
1	852-312433-001	Resistor, Carbon Film, 43K Ω , \pm 5%
1	906-042012-008	Socket, IC, 8 Pin
3	910-041452-001	Jack, Phone, 1/4", NC
1	910-041452-002	Jack, Phone, 1/4", NO
1	919-041075-001	Diode, 1N4148
1	913-045098-001	Overlay, Rear Panel
1	993-045097-001	Bulletin No. 1312

WIRES: LENGTH (IN INCHES) AND COLOR

2	987-040751-111	8 and 14, Brown
2	987-040751-333	14 and 14, Orange
2	987-040751-444	16 and 28, Yellow
2	987-040751-555	14 and 28, Green
3	987-040751-666	16, 16 and 16, Blue
2	987-040751-888	14 and 24, Gray
2	987-040751-999	8 and 14, White
2	987-040751-929	8 and 14, White/Red
2	987-040751-939	14 and 14, White/Orange
3	987-040751-949	14, 14 and 8, White/Yellow
2	987-040751-959	14 and 28, White/Green
3	987-040751-969	16, 8 and 16, White/Blue
1	987-040751-979	18, White/Violet

Tape overlay (with backing in place) to rear panel and using an awl or sharp nail and a hammer, mark the center of each hole. Remove the overlay and drill each hole according to the template chart below. Peel the backing off the overlay and carefully press on. If the serial number is 8078 or greater, use only the left hand portion of the overlay, breaking it at the perforation line.

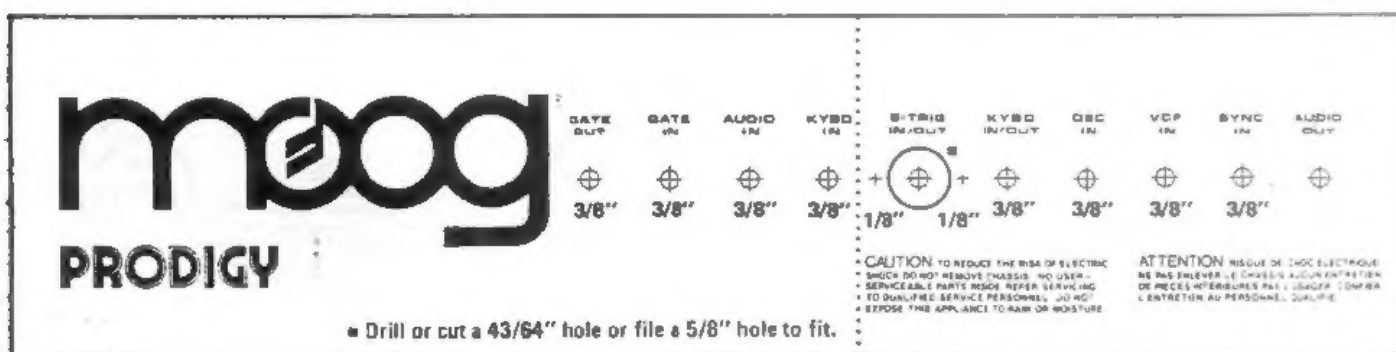


FIGURE 6-1 REAR PANEL OVERLAY AND DRILLING TEMPLATE